

1 CLAIMS

2 We claim:

- 3 *sub 7*
- 4 1. A method for digitally processing transform data
5 representing a phenomenon, the method comprising:
6 performing an inverse transform of said transform data
7 to the real domain forming high-precision numbers;
8 and
9 manipulating said high-precision numbers to produce an
10 effect.
- 11 2. A method as recited in claim 1, further comprising
12 converting said high-precision numbers to integers and
13 clipping the integers to an allowed range forming
14 converted data.
- 15 3. A method as recited in claim 1, wherein the phenomenon is
16 an image.
- 17 4. A method as recited in claim 1, wherein said effect is
18 the chroma-key merging of two data sets.
- 19 5. A method as recited in claim 1, wherein said effect is
20 the color correction of image data.
- 21 6. A method as recited in claim 3, wherein said effect is a
22 90 degree rotation of the image.
- 23 7. A method as recited in claim 1, wherein said
high-precision numbers are floating point numbers.

- 1 8. A method as recited in claim 1, wherein said
2 high-precision numbers are fixed precision numbers
3 including a fractional part.
- 4 9. A method as recited in claim 1, wherein the step of
5 performing employs an inverse discrete cosine
6 transform.
- 7 10. A method as recited in claim 1, wherein the step of
8 performing employs an inverse discrete wavelet
9 transform.
- 10 11. A method as recited in claim 1, wherein the step of
11 performing employs an inverse discrete Fourier
12 transform.
- 13 12. A method for digitally processing transform data in the
14 real domain representing a phenomenon, the method
15 comprising:
16 performing an inverse transform of said transform data
17 to the real domain forming high-precision numbers;
18 and
19 performing a forward transform of said high-precision
20 numbers.
- 21 13. A method as recited in claim 12, wherein the inverse to
22 said forward transform is different from said inverse
23 transform.
- 24 14. A method as recited in claim 13, wherein said forward
25 transform is a forward discrete cosine transform and
26 said inverse transform is an inverse discrete wavelet
27 transform.

- 1 15. A method as recited in claim 1, further comprising
2 implementing an inverse quantization of transform-coded
3 data forming the transform data.
- 4 16. A method as recited in claim 15, further comprising
5 converting said high-precision numbers to integers and
6 clipping the integers to an allowed range forming
7 converted data.
- 8 17. A method as recited in claim 15, further comprising
9 entropy decoding coded data to form the transform-coded
10 data
- 11 18. A method as recited in claim 17, wherein said coded data
12 are coded image data.
- 13 19. A method as recited in claim 17, wherein said coded data
14 are coded video data.
- 15 20. A method as recited in claim 18, wherein said coded
16 image data are in a JPEG still image international
17 standard format.
- 18 21. A method as recited in claim 19, wherein said coded
19 video data are in a MPEG motion video international
20 standard format.
- 21 22. A method as recited in claim 15, wherein the step of
22 performing employs an inverse discrete cosine
23 transform.
- 24 23. A method as recited in claim 15, wherein the step of
25 performing employs an inverse discrete wavelet
26 transform.

1 24. A method as recited in claim 15, wherein the step of
2 performing employs an inverse discrete Fourier
3 transform.

4 25. A method as recited in claim 15, wherein said
5 high-precision numbers are fixed precision numbers that
6 include a fractional part.

7 26. A method as recited in claim 12, further comprising
8 manipulating said high-precision numbers to produce an
9 effect.

10 27. A method for digitally processing transform-coded data
11 representing a phenomenon, the method comprising:
12 performing an inverse quantization of the
13 transform-coded data forming transform data;
14 performing an inverse transform of said transform data
15 to the real domain forming high-precision numbers;
16 performing a forward transform of said high-precision
17 numbers forming forward transformed data; and
18 performing a quantization of said forward transformed
19 data forming quantized data.

20 28. A method as recited in claim 27, further comprising:
21 entropy decoding coded data forming transform-coded
22 data employing entropy decode; and
23 entropy encoding the quantized data employing entropy
24 encode forming encoded data.

25 29. A method as recited in claim 27, further comprising
26 manipulating said high-precision numbers to produce an
27 effect.

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- 1 30. A method as recited in claim 27, further comprising
2 converting said high-precision numbers to integers and
3 clipping to an allowed range forming converted data.
- 4 31. A method as recited in claim 29, further comprising
5 alternating manipulating steps with the steps of
6 performing a forward transform, performing a
7 quantization, entropy encoding, entropy decoding,
8 performing an inverse quantization, and performing an
9 inverse transform a desired number of times.
- 10 32. A method as recited in claim 31, wherein said coded data
11 are compressed data, and each step of alternating
12 implements a compression/decompression cycle.
- 13 33. A system employing the method recited in claim 31,
14 wherein each step of alternating recompresses and
15 decompresses coded data to enable an editing operation.
- 16 34. A method as recited in claim 28, wherein said coded data
17 are coded audio data.
- 18 35. A method as recited in claim 28, wherein said coded data
19 are coded electromagnetic environment data.
- 20 36. A method as recited in claim 28, wherein said coded data
21 are coded video data.
- 22 37. A method as recited in claim 28, wherein said coded data
23 is encoded in the JPEG standard format.
- 24 38. A system for digitally processing first level
25 transform-coded data in the real domain representing a
26 phenomenon, the system comprising:

- 1 a first inverse quantizer to generate transform data
2 from said transform-coded data;
- 3 a first inverse transformer to produce an inverse
4 transform of said transform data to the real
5 domain forming high-precision numbers;
- 6 a first forward transformer for forward transforming
7 said high-precision numbers forming forward
8 transformed data; and
- 9 a first quantizer for quantizing said forward
10 transformed data to form quantized data.
- 11 39. A system as recited in claim 38, wherein the forward
12 transformer employs a different transform type than a
13 first transform type employed by the inverse
14 transformer.
- 15 40. A system as recited in claim 38, wherein said forward
16 transformer produces a forward discrete cosine
17 transform and said inverse transformer produces an
18 inverse discrete wavelet transform.
- 19 41. A system as recited in claim 38, further comprising:
20 a manipulator for manipulating the high-precision
21 numbers to produce an effect.
- 22 42. A system as recited in claim 38, wherein said inverse
23 quantizer and said quantizer use identical quantization
24 values.
- 25 43. A system as recited in claim 41, wherein only a subset
26 of the quantized transform data produced different
27 transform-coded data.

1 44. A system as recited in claim 38, wherein said inverse
2 quantizer and said quantizer use at least one different
3 quantization value.

4 45. A system as recited in claim 38, further comprising:
5 an entropy decoder to form the transform-coded data
6 from coded data; and
7 an entropy encoder to encode the quantized data.

8 *9/27* 46. A system for digitally processing transform data
9 representing a phenomenon, the system comprising:
10 an inverse transformer to perform an inverse transform
11 of the transform data to the real domain using
12 high-precision numbers; and
13 a manipulator to manipulate the high-precision numbers
14 to produce an effect.

15 47. A system as recited in claim 46, further comprising a
16 converter to convert said high-precision numbers to
17 integers, and a clipper to clip the integers to an
18 allowed range.

19 *9/23* 48. A system for digitally processing transform-coded data
20 representing a phenomenon, the system comprising:
21 an inverse quantizer to perform an inverse quantization
22 of said transform-coded data to form transform
23 data;
24 an inverse transformer to perform an inverse transform
25 of said transform data to the real domain forming
26 high-precision numbers; and

1 a manipulator for manipulating the high-precision
2 numbers to produce an effect.

3 49. A system as recited in claim 48, further comprising a
4 converter to convert said high-precision numbers to
5 integers, and a clipper to clip the integers to an
6 allowed range.

7 50. A system for digitally processing transform data in the
8 real domain representing a phenomenon, the system
9 comprising:

10 an inverse transformer to produce an inverse transform
11 of the transform data to the real domain to form
12 high-precision numbers; and

13 a forward transformer to forward transform the
14 high-precision numbers.

15 51. A system as recited in claim 50, further comprising:

16 a manipulator to manipulate the high-precision numbers
17 to produce an effect.

18 52. A system as recited in claim 41, wherein the quantized
19 data forms an other level of transform-coded data and
20 further comprising:

21 another inverse quantizer, another inverse transformer,
22 another manipulator, another forward transformer,
23 and another quantizer to perform together a
24 similar function on the other level of
25 transform-coded data as performed on the first
26 level transform-coded data.

- 1 53. A system as recited in claim 52, wherein the effect
2 produced by the first manipulator is a different type
3 of effect from that produced by the other manipulator.
- 4 54. A system as recited in claim 52, wherein the functions
5 of the first inverse quantizer, first inverse
6 transformer, first forward transformer, and first
7 quantizer, and the respective functions of said another
8 inverse quantizer, another inverse transformer, another
9 forward transformer, and another quantizer are each
10 performed by a same module.
- 11 55. A method as recited in claim 2, further comprising
12 providing said converted data for use by an output
13 device.
- 14 56. A method as recited in claim 55, wherein the output
15 device is a display monitor.
- 16 57. A method as recited in claim 55, wherein the output
17 device is a raster display monitor.
- 18 58. A method as recited in claim 1, wherein the transform
19 data includes information of a spectral analysis.
- 20 59. An article of manufacture comprising a computer usable
21 medium having computer readable program code means
22 embodied therein for digitally processing transform
23 data representing a phenomenon, the computer readable
24 program code means in said article of manufacture
25 comprising computer readable program code means for
26 causing a computer to effect:

1 performing an inverse transform of said transform data
2 to the real domain forming high-precision numbers;
3 and
4 manipulating said high-precision numbers to produce an
5 effect.

6 60. An article of manufacture as recited in claim 59, the
7 computer readable program code means in said article of
8 manufacture further comprising computer readable
9 program code means for causing a computer to effect
10 converting said high-precision numbers to integers and
11 clipping the integers to an allowed range forming
12 converted data.

13 61. An article of manufacture as recited in claim 59,
14 wherein the phenomenon is an image.

15 62. A computer program product comprising a computer usable
16 medium having computer readable program code means
17 embodied therein for digitally processing transform
18 data in the real domain representing a phenomenon, the
19 computer readable program code means in said computer
20 program product comprising computer readable program
21 code means for causing a computer to effect:

22 performing an inverse transform of said transform data
23 to the real domain forming high-precision numbers;
24 and
25 performing a forward transform of said high-precision
26 numbers.

1 63. A computer program product as recited in claim 62,
2 wherein the inverse to said forward transform is
3 different from said inverse transform.

4 64. A computer program product as recited in claim 62,
5 wherein said forward transform is a forward discrete
6 cosine transform and said inverse transform is an
7 inverse discrete wavelet transform.

8 *8/10/97* 65. A program storage device readable by machine, tangibly
9 embodying a program of instructions executable by the
10 machine to perform method steps for digitally
11 processing transform-coded data representing a
12 phenomenon, said method steps comprising:
13 performing an inverse quantization of said
14 transform-coded data forming transform data;
15 performing an inverse transform of said transform data
16 to the real domain forming high-precision numbers;
17 and
18 manipulating said high-precision numbers to produce an
19 effect.

20 66. A computer program product as recited in claim 65, the
21 computer readable program code means in said computer
22 program product further comprising converting said
23 high-precision numbers to integers and clipping the
24 integers to an allowed range forming converted data.

25 67. A program storage device readable by machine, tangibly
26 embodying a program of instructions executable by the
27 machine to perform method steps for digitally

- 1 processing transform-coded data representing a
2 phenomenon, said method steps comprising:
3 performing an inverse quantization of the
4 transform-coded data forming transform data;
5 performing an inverse transform of said transform data
6 to the real domain forming high-precision numbers;
7 performing a forward transform of said high-precision
8 numbers forming forward transform data; and
9 performing a quantization of said forward transformed
10 data forming quantized data.
- 11 68. A program storage device readable by machine as recited
12 in claim 67, said method steps further comprising
13 manipulating said high-precision numbers to produce an
14 effect.
- 15 69. A program storage device readable by machine as recited
16 in claim 67, said method steps further comprising
17 converting said high-precision numbers to integers and
18 clipping to an allowed range forming converted data.
- 19 70. A program storage device readable by machine as recited
20 in claim 67, said method steps further comprising:
21 entropy decoding coded data forming transform-coded
22 data employing entropy decode; and
23 entropy encoding the quantized data employing lossless
24 entropy encode forming encoded data.
- 25 71. A program storage device readable by machine as recited
26 in claim 70, said method steps further comprising
27 alternating said manipulating steps with said steps of

1 performing a forward transform, performing a
2 quantization, entropy encoding, entropy decoding,
3 performing an inverse quantization, and performing an
4 inverse transform a desired number of times.

5 72. A program storage device readable by machine as recited
6 in claim 71, wherein said coded data are compressed
7 data, and each step of alternating implements a
8 compression/decompression cycle.

9 73. A program storage device readable by machine as recited
10 in claim 70, wherein the phenomenon is image data
11 encoded in the JPEG standard format.

12 74. A method for digitally processing transform data in the
13 real domain representing a phenomenon, the method
14 comprising:

15 performing an inverse transform of said transform data
16 to the real domain forming high-precision numbers;
17 converting the high-precision numbers to integers which
18 include out of range data; and
19 performing a forward transform of the integers forming
20 forward transformed data.

21 75. A method as recited in claim 74, further comprising
22 manipulating the integers to produce an effect.

23 76. A method as recited in claim 74, further comprising:

24 performing an inverse quantization of transform-coded
25 data to form the transform data; and

26 performing a quantization of said forward transformed
27 data forming quantized data.

1 77. A method as recited in claim 74, further comprising
2 clipping the integers to an allowed range forming
3 converted data.

4 78. A method as recited in claim 76, further comprising
5 alternating manipulating steps with the steps of
6 performing a forward transform, performing a
7 quantization, performing an inverse quantization, and
8 performing an inverse transform a desired number of
9 times.

10 79. A program storage device readable by machine, tangibly
11 embodying a program of instructions executable by the
12 machine to perform method steps for digitally
13 processing transform data in the real domain
14 representing a phenomenon, said method steps
15 comprising:
16 performing an inverse transform of said transform data
17 to the real domain forming high-precision numbers;
18 converting the high-precision numbers to integers which
19 include out of range data; and
20 performing a forward transform of the integers forming
21 forward transformed data.

22 80. A program storage device readable by machine, as recited
23 in claim 79, further comprising manipulating the
24 integers to produce an effect.

25 81. A program storage device readable by machine, as recited
26 in claim 79, further comprising performing an inverse
27 quantization of transform-coded data to form the
28 transform data.

1 82. A program storage device readable by machine, as recited
2 in claim 79, further comprising performing a
3 quantization of said forward transformed data forming
4 quantized data.

5 83. A program storage device readable by machine, as recited
6 in claim 79, further comprising clipping the integers
7 to an allowed range forming converted data.

8 84. A method as recited in claim 17, wherein said coded data
9 are coded audio data.

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